

Claims

- [c1] 1. A method for controlling the linewidth of a feature formed within a lithography mask, the method comprising:
- electrochemically depositing an additive material on exposed sidewalls of an etched first layer of the mask, wherein the top of said etched first layer remains covered by a hardmask used during the etching of said first layer; and
 - wherein a second layer beneath said etched first layer is resistant to the electrochemical deposition of said additive material thereupon.
- [c2] 2. The method of claim 1, further comprising:
- removing said hardmask; and
 - etching said second layer with a resulting pattern defined by said etched first layer plus said additive material.
- [c3] 3. The method of claim 2, wherein said electrochemically depositing said additive material further comprises an electroless deposition process.
- [c4] 4. The method of claim 2, wherein said electrochemically

depositing said additive material further comprises an electroplating process.

- [c5] 5. The method of claim 1, wherein:
- said first layer comprises an optically opaque layer;
 - and
 - said second layer comprises a buffer layer between said first layer and a reflective layer underneath said second layer.
- [c6] 6. The method of claim 1, wherein:
- said first layer comprises one of a nickel and a cobalt nickel alloy layer;
 - said second layer comprises a tantalum nitride layer;
 - and
 - said hardmask further comprises a dielectric layer.
- [c7] 7. A method for controlling the linewidth in an extreme ultraviolet lithography (EUVL) mask, the method comprising:
- electrochemically depositing an additive material on exposed sidewalls of an etched absorber layer of the mask, wherein the top of said etched absorber layer remains covered by a hardmask used during the etching of said etched absorber layer; and
 - wherein a buffer layer beneath said etched absorber layer is resistant to the electrochemical deposition of

said additive material thereupon.

- [c8] 8. The method of claim 7, further comprising:
removing said hardmask; and
etching said buffer layer with a resulting pattern defined by said absorber first layer plus said additive material.
- [c9] 9. The method of claim 8, wherein said electrochemically depositing said additive material further comprises an electroless deposition process.
- [c10] 10. The method of claim 8, wherein said electrochemically depositing said additive material further comprises an electroplating process.
- [c11] 11. The method of claim 7, wherein:
said absorber layer comprises an optically opaque layer; and
said buffer layer is disposed between said absorber layer and a multilayer (ML) reflective layer underneath said buffer layer.
- [c12] 12. The method of claim 7, wherein:
said absorber layer comprises one of a nickel and a cobalt nickel alloy layer;
said buffer layer comprises a tantalum nitride layer;
and

said hardmask further comprises a dielectric layer.

[c13] 13. The method of claim 12, wherein said ML reflective layer further comprises alternating layers of molybdenum (Mo) and silicon (Si).

[c14] 14. The method of claim 7, wherein said electrochemically depositing an additive material is implemented with an electroplating bath comprising at least one of platinum (Pt), ruthenium (Ru), palladium (Pd), cobalt (Co), and cobalt tungsten (CoW).

[c15] 15. An extreme ultraviolet lithography (EUVL) mask structure, comprising:
a multilayer (ML) reflective layer formed on a starting substrate;
a buffer layer formed on said reflective layer;
an absorber layer formed on said buffer layer,
wherein said absorber layer includes an electrochemically deposited additive material on exposed sidewalls during initial etching thereof.

[c16] 16. The EUVL mask structure of claim 15, The method of claim 8, wherein said electrochemically deposited additive material further comprises an electrolessly deposited material.

[c17] 17. The EUVL mask structure of claim 15, wherein said

electrochemically deposited additive material further comprises an electroplated material.

- [c18] 18. The EUVL mask structure of claim 15, wherein said absorber layer comprises an optically opaque layer.
- [c19] 19. The EUVL mask structure of claim 15, wherein:
 - said absorber layer comprises one of a nickel and a cobalt nickel alloy layer; and
 - said buffer layer comprises a tantalum nitride layer.
- [c20] 20. The EUVL mask structure of claim 19, wherein said ML reflective layer further comprises alternating layers of molybdenum (Mo) and silicon (Si).
- [c21] 21. The EUVL mask structure of claim 15, wherein said electrochemically deposited additive material is implemented with an electroplating bath comprising at least one of platinum (Pt), ruthenium (Ru), palladium (Pd), cobalt (Co), and cobalt tungsten (CoW).